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# CALIFORNIA SMART GROWTH ENERGY SAVINGS MPO SURVEY FINDINGS

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# *California Smart Growth Energy Savings*
# *MPO Survey Findings*

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## Table of Contents

# INTRODUCTION

This effort supports the California Energy Commission (CEC) in seeking to assess potential statewide reductions in transportation energy consumption resulting from Smart Growth planning. Since energy consumed by transportation (particularly autos) comprises a large share of total energy consumption, its reduction through more compact land use and other supporting measures is an important component of overall energy policy. This effort will support the Commission's recommended strategy, as part of state bill AB 2076, to reduce California's dependence on petroleum.

For this effort, all California Municipal Planning Organizations (MPOs) were contacted and surveyed regarding Smart Growth studies and associated transportation analyses occurring within their region. This information was extrapolated to estimate total transportation energy reduction statewide resulting from Smart Growth land use policies.

California could reduce statewide transportation energy consumption by 3-10% with the implementation of Smart Growth policies across the State. This 3-10% reduction leads to energy savings of 60 – 237 trillion BTUs or 0.6-2.3 billion gallons of fuel annually. The estimates are extrapolated from Smart Growth travel modeling efforts in five California regions: Los Angeles (Western Riverside County), San Francisco, San Diego, Sacramento, and Monterey. The estimates reflect four Smart Growth actions: (1) City and transit station-focused land use development; (2) Increases in transit supply; (3) Market pricing (parking fees); and (4) Improvements to regional job-housing balance. The statewide extrapolation adjusts for local conditions of transit availability, high population growth, and regional jobs-housing imbalances.

This report begins by discussing the findings of the MPO survey effort (section 1), with emphasis on those regions that have measured the travel impacts of Smart Growth land use alternatives (section 2). Using this information, Smart Growth energy savings were extrapolated statewide and compared with earlier, more theoretical, estimates (section 3). The extrapolation takes into account uncertainties and variations in assumptions in the MPO estimates. The report ends (section 4) with closing remarks providing guidance for regional and statewide recommendations on energy efficient land use policy.

# 1. CALIFORNIA MPO SMART GROWTH SURVEY

In summer 2001, 15 California Municipal Planning Organizations (MPOs) were surveyed regarding their analysis of Smart Growth land use planning and associated travel impacts. The MPOs and their geographic region are identified in Table 1 and Figure 1. The survey, included in Appendix A, asked whether the region had evaluated Smart Growth planning scenarios. All regions were also asked to identify, from their current 20-year Regional Transportation Plan (RTP) their region growth characteristics, and the associated travel demand without Smart Growth. Those regions with Smart Growth efforts provided additional information on the assumed scenarios and their travel impact. Finally, an assessment was made of the modeling capabilities of each region to fully evaluate Smart Growth land use scenarios. The remainder of this section summarizes the survey results.

**TABLE 1: California Municipal Planning Organizations (MPOs)**

| California Municipal Planning Organization | | Major City | Counties |
|---|---|---|---|
| SCAG | Southern California Association of Governments | Los Angeles | Imperial, Los Angeles, Orange, Riverside, San Bernardino, Ventura |
| MTC | Metropolitan Transportation Commission | San Francisco | Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Sonoma, Solano |
| SANDAG | San Diego Association of Governments | San Diego | San Diego |
| SACOG | Sacramento Area Council of Governments | Sacramento | El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba |
| FresnoCOG | Council of Fresno County Governments | Fresno | Fresno |
| AMBAG | Association of Monterey Bay Area Governments | Monterey | Monterey, San Benito, Santa Cruz |
| KernCOG | Kern Council of Governments | Bakersfield | Kern |
| SJCOG | San Joaquin County Council of Governments | Stockton | San Joaquin |
| StanCOG | Stanislaus Area Association of Governments | Modesto | Stanislaus |
| SBCAG | Santa Barbara County Association of Governments | Santa Barbara | Santa Barbara |
| TCAG | Tulare County Association of Governments | Visalia | Tulare |
| SLOCOG | San Luis Obispo Area Coordinating Council | San Luis Obispo | San Luis Obispo |
| BCAG | Butte County Association of Governments | Chico | Butte |
| MCAG | Merced County Association of Governments | Merced | Merced |
| SCRTPA | Shasta County Regional Transportation Planning Agency | Redding | Shasta |

**Figure 1: California Counties**

All but one California MPO (TCAG) responded to at least part of the survey by including a discussion of Smart Growth planning efforts in their region. Demographic, land use, and transportation data for a Trend case, assuming no Smart Growth, was supplied by all but four California MPOs. Six regions identified recent quantitative efforts in evaluating some type of Smart Growth scenarios, with one providing only qualitative discussions on their evaluation. In some cases, the Smart Growth effort was not always performed directly by the MPOs. The regions evaluating Smart Growth are:

- Los Angeles (Western Riverside County only)
- San Francisco (MTC and RAFT[1])
- San Diego (SANDAG)
- Sacramento (SACOG and UCDavis[2])
- Monterey (AMBAG)
- Bakersfield (KernCOG) – informal, no quantitative data

Several of these areas are non-attainment air quality regions or face resource restraints (e.g., vacant land, water supply), which often provide the impetus for initiating Smart Growth evaluations and more sophisticated travel modeling. In two cases, these MPO alternate growth scenarios were furthered by outside agencies, including advocacy groups (RAFT in San Francisco, Sierra Club in Bakersfield) and university efforts (UCDavis). In Los Angeles, a local jurisdiction has initiated a multi-disciplinary analysis on a small sub-region, Western Riverside County. Two other regions noted that they plan to evaluate Smart Growth land use scenarios in the next few years: Santa Barbara (SBCAG) and Los Angeles (SCAG). Two others were interested, based on potential growth issues, but with a less definite schedule for such efforts: San Louis Obispo (SLOCOG) and Merced (MCAG).

It should be noted that only those regions identifying specific Smart Growth alternate scenarios to the standard RTP were considered. Thus, less formal Smart Growth efforts by local jurisdictions are not included. As the Sacramento response noted, some jurisdictions had already done a great deal to minimize auto travel while others have not.

For those not actively pursuing Smart Growth scenarios, half discussed recent steps towards Smart Growth planning and/or keen interest in implementing Smart Growth policies. Santa Barbara and Los Angeles indicated that they will begin formal efforts in the next year. The remaining MPOs indicated that the impetus for such efforts must come from local jurisdictions, not the MPO. Regarding the workload and expense of such efforts, one MPO was enthusiastic about the potential support of CA AB2140 in providing funding for RTP alternative growth scenario evaluations.

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1 Regional Alliance for Transit (RAFT) is an advocacy group interested in a more economic and environmental approach to transportation in the San Francisco Bay Area. The group posed an alternative to the 1995 RTP that was eventually evaluated within the MPO's travel model.

2 UCDavis has been working closely with SACOG on efforts to evaluate alternative transportation models. One effort compares output from 4 different model forms under various scenarios, including a rail investment/pricing scenario, which is included in this report.

The regions that have evaluated Smart Growth identified the following types of scenarios. (All plans affected the location of new population and employment growth rather than modify existing uses).

- Directing growth (at increased densities) to city or urban areas (including infill development) while preserving open space.
- Directing growth (at increased densities and mixed uses), near existing or proposed transit stations.
- Increasing or expanding transit service
- Imposing market pricing on auto use (increase parking charges or auto operating costs)

As discussed in more detail in the next section, the travel reductions under Smart Growth scenarios ranged from 1-14%, with the highest reductions found in the most aggressive scenarios.

All regions' indicated that their Smart Growth evaluations were sketch-planning exercises that were independent of local land use plans. The most sophisticated methods applied GIS-based tools to identify available redevelopment (AMBAG) and/or worked with a framework of local land use plans (SANDAG). Some quotes from their reports follow:

> **San Francisco (MTC)** – "Developed without acknowledgement of the local land use plans or policies, cost of development, ability of areas to attract business, environmental concerns, etc. Density increases are likely to be inconsistent with many local jurisdictions' general plans."
>
> **Monterey** – "Scenarios are conceptual and do not present or convey any policies or recommendations. Meant to illustrate the capabilities of regional planning tools to assess how change in planned land uses might affect the expected commute patterns." "Designed to maximize the differences between scenarios."
>
> **San Diego** – "Starting point for comparing alternatives." "Although changes to current plans are felt necessary, MPO staff is not recommending any particular alternative."
>
> **Sacramento (SACOG)** – "Initial assessment of possible impacts that Smart Growth could have on the region." Seeks "ball park" estimate of changes that could be realized for AB680.

Today, sophisticated computer models are typically used to assist policy makers in planning transportation investments. The modeling capabilities across the regions ranges from highly sophisticated to having no in-house transport model at all. At the most complex level are regions like San Francisco (MTC) and Los Angeles (SCAG), where models embody significant enhancements over off-the-shelf four-step models.[3] Enhancements include cross-classification of trip generation to include sensitivity to auto

[3] The traditional four-step model analysis typically follows, in a sequential manner, without feedback, the steps of trip generation, trip distribution, mode split, and trip assignment.

ownership, household size, and income groups; more sophisticated mode split modeling; feedback of congestion on destination, mode, and route choice; and often include land use interactions. However, these models, do not incorporate the latest advances in activity-based trip making and full transport-land use interactions that have been found to be increasingly important in evaluating long term land use response to travel costs and induced demand effects. The standard 4-step models used in most of the regions prove less capable in evaluating modes choice (many regions estimated transit manually outside of the model) and showing congestion response.

The importance of land use feedback is shown by the Sacramento (UCDavis) analysis, which compared models with and without long-term land use feedback. Three of the four models analyzed allowed land use to change in response to transportation costs, including congestion. Under the Smart Growth scenarios, the land use feedback models all predicted lower vehicle miles of travel (VMT) growth than the MPO SACMET model by at least 5%.

An important input to the modeling process for Smart Growth efforts is the allocation of future land use. This is typically a fixed assumption. All regions identified a policy-based process for forecasting future demographic and land use scenarios. The MPO forecast thus typically consists of a compilation/consensus of jurisdictional forecasts (e.g., county general plans or regional entities compiling local plans) allocated to traffic analysis zones by the MPO. This allocation of future housing and employment was based on the following land use plan attributes and regional trends: land supply designated for development, new land availability, density of developed land, county/city land use plan allowable uses and densities, existing area population and household size, recent employment location trends, proximity to existing development, and availability of sewer/water services.

Of the nine regions identifying the modes within their model, all indicated that their models estimate auto mode. Seven regions included transit mode, 5 regions included a separate shared ride auto mode, and 4 regions directly modeled non-motorized modes (i.e., walk and bike).

## 2. MPO ESTIMATED SMART GROWTH TRAVEL REDUCTIONS

This section focuses on the 5 regions (7 studies, covering 41% of 2000 state population) that evaluated Smart Growth scenarios. It quantifies and compares the assumptions used in these evaluations, and the resulting travel and energy impacts. One case (Sacramento-SACOG) involved a simple application of reduced VMT per capita rates to the urbanized areas and RTP forecasts. Other areas involved new analysis using modified inputs within the region's transportation planning models.

Table 2 summaries the data from the provided Smart Growth scenarios. As the table shows, the review of the Smart Growth studies, at the depth available under this effort, reveals little relationship between the Smart Growth VMT/Energy reductions and other initial (input) assumptions; no obvious cause and effect relationships were observed. The remainder of this section discusses the assumptions and outcomes from these regional studies.

### 2.1. Smart Growth Scenarios

The Smart Growth scenario assumptions, contrasting with the Trend or no Smart Growth scenario (typically from Regional Transportation Plan), are summarized below. These scenarios reduce vehicle miles traveled, and thus transportation energy, by either encouraging alternate modes (increased transit supply, and market pricing) or reduce trip length (city-centered or transit-station-centered growth, jobs-housing balance).

City-Centered or Transit-Station Centered Growth:

All five regions (all but Sacramento (UCDavis) study) involved the reallocation of new population and employment to urban areas or transit-station nodes. This reallocation implied increased localized density of either or both population and employment. In city-centered development scenarios typically some or all forecasted growth in population and employment was redistributed within existing central city boundaries. In transit station-centered growth scenarios, the focus was typically within 0.5 miles or less of existing and/or future transit station.

Transit Supply

Three regions (Western Riverside, San Francisco, and Sacramento) explicitly modeled improved transit supply. This typically entailed extension of existing lines and/or increased service frequency. Unfortunately, it was difficult to gauge the level of service improvement, on which the ability to shift travel from auto to transit is highly dependant. Additionally, two regions (San Diego and Monterey) with transit station-focused land use scenarios did not explicitly identify transit improvements. It was assumed that sufficient transit supply was available as part of their Trend scenario.

Market Pricing

Two regions (San Francisco and Sacramento) assessed the effects of pricing, in combination with other assumptions. This was modeled by increasing the cost of auto operating costs (e.g. gas taxes) and/or parking. Current under pricing of the auto essentially subsidizes private auto use at the expense of Smart Growth objectives of compact development and use of alternate modes.

Jobs-Housing Balance

One region (Western Riverside) evaluated a scenario to directly impact the Jobs/housing balance by increasing employment in the region over Trend forecasts (this study modeled only a small portion of the larger MPO region). By attracting development (jobs or residents) to bring the jobs-housing ratio in better alignment, trips would be shortened. Additionally, transit-supported nodal development would influence mode shifts to carpools and transit.

### 2.2. Smart Growth Benefits

This section notes the types and magnitudes of Smart Growth benefits and their impact on energy, as identified by these studies. The land use assumptions and transportation findings are summarized in Table 2.

## TABLE 2: Summary of CA MPO Smart Growth Analyses

| | | Scenario Attributes | | | | | Scenario Outputs | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Study Region | Scenario | City-Centered | Transit-Centered | Transit Supply | Market Pricing | Jobs-Housing | VMT Savings | VMT/ Capita | Transit Riders | Walk/ Bike | Vehicle Trips | Travel Speeds | Vehicle Hours | Land (2) Savings |
| Los Angeles | | | | | | | | | | | | | | |
| Riverside | City-Centered | X | | | | | -0.23% | NA | -1% | | | <1% | +0.2% | |
| | Transit-Centered + Transit Supply | | X | X | | | -1.66% | NA | +17% | | | +1% | -2.6% | |
| | Improve Jobs-Housing Balance | | | | | X | 1.56% | NA | -3% | | | +4% | -2.0% | |
| San Francisco | | | | | | | | | | | | | | |
| San Francisco (MTC) | City/Transit-Centered | X | X | | | | -1.73% | 20.74 | +25% | +5% | -0.9% | +1.1% | -2.5% | 75,000 |
| | City/Transit-Centered + Transit Supply | X | X | X | | | -2.44% | 20.58 | +30% | +5% | -1.4% | +1.9% | -3.7% | 75,000 |
| | Pricing | | | | X | | -0.78% | 20.93 | +3% | +1% | -0.6% | +2.1% | -2.9% | 75,000 |
| | Pricing + Transit Supply | | | X | X | | -1.51% | 20.78 | +9% | +1% | -1.1% | +3.1% | -4.3% | 75,000 |
| San Francisco (RAFT) | | X | X | X | X | | -6.30% | 17.56 | +24% | | | <1% | -13% | 128,000 |
| San Diego | | | | | | | | | | | | | | |
| San Diego | Transit-Centered | | X | * | | | -13.03% | 26.63 | +34% | +14% | -1.3% | | -21.2% | 280,000 |
| | Transit/City-Centered | X | X | * | | | -14.23% | 26.26 | +34% | +14% | -1.3% | | -22.4% | 400,000 |
| | Transit/City-Centered with caps | X | X | * | | | -12.64% | 26.75 | +35% | +15% | -1.4% | | -21.5% | 400,000 |
| Sacramento | | | | | | | | | | | | | | |
| Sacramento (SACOG) | | X | X | | | | -11% | NA | | | | | | |
| Sacramento (UCDavis) | (SACOG model) | | | X | X | | -1.61% | 25.95 | +29% | +1% | 0% | -0.3% | | |
| | (MEPLAN model) (1) | | | X | X | | -6.93% | 14.09 | +27% | +1% | -3.2% | -1.1% | | |
| Monterey | | | | | | | | | | | | | | |
| Monterey | City-Centered | X | | | | | -8.90% | 22.51 | | | | | | |
| | Transit-Centered | | X | * | | | -8.28% | 23.99 | | | | | | |

(1) MEPLAN model includes land use feedback.
(2) Acres of vacant/open space preserved.

- **Travel (VMT, VMT/capita)**

VMT has a direct correlation with transportation energy consumption. Smart Growth VMT savings for city-centered land use development ranged from: 0.2% (Riverside) to 11% (Sacramento), and 12.2%(Monterey). Scenarios of transit station-focused development typically combined with some level of increased transit supply, reducing VMT by 1.7% (Riverside) to 13.0% (San Diego). Pricing was studied in San Francisco and Sacramento; San Francisco (MTC) runs imply pricing leads to a 0.8% travel reduction. Jobs-housing balance improvement in Riverside (28% increase in jobs/HH ratio) led to a 1.6% reduction in daily travel.

- **Alternate Modes**

The Smart Growth scenarios had a significant effect on increasing transit and non-motorized travel, reducing transportation energy consumption. Land use scenarios had transit ridership increases ranging from 17% to 32%. Non-motorized travel (bike and walk) was shown to increase by 1-5% in San Francisco and Sacramento, with San Diego showing a much larger 14% increase.

Because auto usage dominates travel in most regions, the large increases in alternate mode usage have less impact on overall mode split (transit share increases by 1-3%), and overall vehicle trips (decline by 1-2%). However, in absolute terms, such changes may be significant.

- **Trip lengths and Jobs-housing balance**

Reduced trip lengths, sometimes caused by better jobs-housing balance, directly reduce regional travel and energy consumption. Two regions noted reductions in average trip lengths. Sacramento (UCDavis) found 1.6-3.8% reduction in average trip distance, with SANDAG finding a more significant 14-16% reduction.

Monterey found a better job-housing balance reduced trip lengths and congestion – a 10% decline in commutes under the Smart Growth city-centered scenario and a 5% decline with the commuter rail scenario. San Francisco (RAFT) noted a 63% reduction in commutes by residents in outlying counties to Bay Area jobs. San Diego noted an improved job balance both across and within (between cities and unincorporated areas) the region.

- **Congestion**

Reduced congestion leads to lower vehicle hours of travel (VHT), and thus less energy consumption for the same travel demand. Speeds declined by 0-4% in 4 regions, with the largest change attributable to the Riverside improved jobs-housing balance.

### 2.3. Study Assumptions and Uncertainties

The data provided for this study from the 5 regions is limited; thus, it is difficult to assess with precision the effect of Smart Growth. For example, although a region may assume higher densities, if the land uses are not mixed, higher densities may not reduce auto travel and energy. Additionally, models generally underestimate the benefit of reducing short auto trips, since such trips are rarely captured in regional models.

The following items lend uncertainty to the MPO Smart Growth data and their application to statewide benefits:

- Difficulty in assessing the details of assumed density increases
- Assumptions regarding mixed use when densities are increased
- Difficulty in understanding the nature of transit supply changes
- Capabilities of the transportation models to fully account for Smart Growth impacts.

# 3. STATEWIDE ANNUAL ENERGY SAVINGS ESTIMATE

This section discusses the estimation of total statewide annual energy reduction, as extrapolated from the MPO-provided Smart Growth scenario, discussed in the previous section. Initially, the energy consumption of the Trend scenario (no Smart Growth) is compared across regions, followed by estimation of statewide Smart Growth benefits.

## 3.1. Comparing regional attributes

This section discusses five regional attributes, tallied by MPO models that have an influence on transportation energy consumption. Table 3 identifies the Trend scenario data.

- **Demographics**

Population growth is the largest determinant of transportation energy consumption. As shown in Table 3, the state is dominated by Los Angeles, San Francisco, San Diego, and Sacramento, which together account for 69% of forecast statewide population growth. Luckily all have in some way begun to look into Smart Growth planning efforts. Although these regions hold an advantage with already established activity "centers" and significant transit systems, large opportunities for Smart Growth also lie with the smaller communities. The smaller communities tend to show larger growth rates.

- **Jobs-Housing balance**

A balanced jobs-housing ratio reduces commuting trip lengths, leading to lower energy consumption. A balanced region jobs per household ratio would be approximately 1.2.[4] Based on this, the jobs to household ratios of Table 3 indicate that several regions may be unnecessarily contributing to VMT through in-commuting. Conversely, some regions show excess housing, which has a similar detrimental effect on VMT. Monterey and Riverside both address this issue in their Smart Growth assessments, noting housing pricing differentials as a key ingredient.

- **Transit Usage**

High transit use reduces energy consumption. Table 3 transit mode split data shows the expected trend of high transit use in the larger cities. Notable exceptions are the high usage in Modesto and Chico.

[4] Based on excess jobs per employable resident in San Francisco (MTC) and Monterey for 2000.

**TABLE 3: Statewide Trends without Smart Growth**

| | **2000 Data: (1)** | **2020 Forecast Data: (1)** | | | **Regional Metrics:** | | | | **Daily VMT:** | | **Annual Energy: (4)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Census | | | annual | current | | future | | current | future | (billion BTUs) | |
| MPO Region | Pop (M) | Pop (M) | Jobs (M) | Pop rate | jobs/HH | Transit | jobs/HH | Transit | /capita | /capita | 2000 | 2020 |
| Los Angeles | 16.52 | 21.08 | 9.34 | 1.21% | 1.34 | NA | 1.34 | NA | 22.15 | 22.51 | 771,323 | 1,007,589 |
| San Francisco | 6.78 | 7.77 | 4.40 | 0.65% | 1.42 | 7.5% | 1.55 | 7.1% | 19.53 | 21.82 | 271,515 | 354,436 |
| San Diego | 2.81 | 3.85 | 1.72 | 1.48% | 1.19 | 1.5% | 1.23 | 1.9% | 28.00 | 34.44 | 185,582 | 280,268 |
| Sacramento (8) | 1.94 | 2.66 | 1.20 | 1.82% | 1.12 | 1.0% | 1.22 | 1.0% | 24.67 | 26.29 | 98,876 | 148,078 |
| Fresno | 0.80 | 1.20 | 0.50 | 1.83% | 1.23 | <0.5% | 1.26 | NA | 22.04 | 23.31 | 40,384 | 62,355 |
| Monterey | 0.71 | 0.90 | 0.43 | 1.34% | 1.42 | NA | 1.40 | NA | 24.71 | 24.68 | 36,370 | 47,412 |
| Bakersfield | 0.66 | 1.28 | 0.50 | 3.11% | 1.15 | 1.0% | 1.26 | 1.0% | 26.50 | 23.94 | 85,150 | 70,215 |
| Stockton | 0.56 | 0.83 | 0.27 | 1.89% | 1.13 | 6.0% | 0.94 | 6.0% | 25.81 | 28.98 | 30,917 | 50,726 |
| Modesto | 0.45 | 0.62 | NA | **1.65%** | NA | NA | NA | NA | **24.90** | 27.72 | 23,648 | 36,539 |
| Santa Barbara | 0.40 | 0.45 | 0.21 | 0.73% | 1.18 | NA | 1.33 | NA | 24.13 | 26.06 | 20,254 | 24,836 |
| Visalia | 0.37 | 0.51 | NA | **1.65%** | NA | NA | NA | NA | **24.90** | 27.72 | 19,469 | 30,083 |
| San Luis Obispo | 0.25 | 0.34 | NA | **1.65%** | NA | NA | NA | NA | **24.90** | 27.72 | 13,050 | 20,165 |
| Chico | 0.20 | 0.30 | 0.15 | 1.86% | 1.22 | 3.0% | 1.24 | NA | 22.18 | 23.87 | 9,574 | 14,985 |
| Merced | 0.21 | 0.34 | 0.11 | 2.22% | 1.15 | <1% | 1.01 | <5% | 27.47 | 31.95 | 13,512 | 23,923 |
| Redding | 0.16 | 0.23 | 0.08 | 1.57% | 0.88 | NA | 0.82 | NA | **24.90** | 27.72 | 8,834 | 13,389 |
| | | | | | | | | | | | | |
| Outside MPOs (2) | 1.05 | 2.08 | NA | 3.49% | NA | NA | NA | NA | NA | NA | 58,455 | 100,458 |
| | | | | | | | | | | | | |
| State (3) | 33.87 | 44.46 | NA | 1.38% | 1.23 | 0.0% | 1.21 | 0.0% | 24.89 | 25.75 | 1,686,914 | 2,285,456 |

Note: Shaded regions provided Smart Growth data.
Bold values indicate assumptions, based on average of other mid-small MPOs (Stockton, Santa Barbara, Chico).

(1) Population converted from households for several regions, using MPO-provided or 2000 US Census household size.
(2) Calculated as the remainder of state totals, after removing MPO totals.
(3) Non-census state-level data per California Energy Outlook 2000, Vol. II, Transportation Energy Systems, California Energy Commission (Aug 2000), adjusted by -2% to match 2000 Census.
(4) Energy estimate assumes 5,822 BTUs per vehicle mile per Oak Ridge National Laboratory, Transportation Energy Data Book: Edition 19. (1999).

- **Densities**

Pockets of higher densities within a region support transit and non-motorized modes, while low-density areas foster auto-dependence, impacting energy consumption. However, regional average densities that can be computed from the MPO-provided data overlook the importance of local conditions. They do not indicate the density of employment centers of residential corridors.

- **Travel**

Regional vehicle miles traveled (VMT) has a direct impact on transportation energy consumption. Table 3 identifies VMT estimates from the MPO Trend cases (no Smart Growth), including transit and truck in addition to auto miles.[5]

Nationally, VMT per capita rates range from 11-43 miles daily, [6] consistent with the Table 3 MPO-calculated regional rates of 20-28 in 2000 and 22-34 in 2020. Exurban areas exhibit most of the characteristics of sprawl (e.g., low-density, dispersed development and higher vehicle miles of travel) and offer the least opportunity for concentrated Smart Growth development. Other areas, including rural places, tend to have "centers" towards which growth can be directed.

The future VMT/capita increase found in most regions over the forecast period indicates California energy consumption will increase faster than population, consistent with national travel patterns.[7]

### 3.2. Extrapolation of Smart Growth Benefits Statewide

The California Smart Growth studies reviewed in Chapter 2 were used to estimate the effects on energy consumption of implementing Smart Growth policies statewide. The Smart Growth data available for this study does not support a rigorous, quantitative modeling of VMT and energy. Thus, the data were used first within their own regions, and then applied as a range to other regions, before summing to a state level. Since the existing regional studies each evaluated different Smart Growth actions, the statewide estimates were adjusted to take this into account.

Firstly, high and low energy reduction ranges were estimated for the five Smart Growth regions. This involved adjustments to reflect all Smart Growth actions, even though they were not all modeled by all regions. When effects were combined, the calculation used a statistical method to account for the likely high correlation.[8] Energy consumption was calculated based on VMT, at a fixed 5,822 BTU per vehicle mile rate.

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5 Some regions estimated transit mode share outside the model, and thus may not fully reflect transit VMT.

6 Rutgers University, The Brookings Institution, Parsons Brinckerhoff, and ECONorthwest," The Costs of Sprawl – Revisited: Empirical Evidence of Sprawl's Incidence," Transit Cooperative Research Program Project H-10. (December 1999)

7 A recent study attributed 69% of the growth in driving between 1983-1990 to factors other than population growth (e.g., longer average trips, less carpooling, switching from other modes to driving). Source: Surface Transportation Policy Project (STPP), "Why are the Roads So Congested? A Companion Analysis of the Texas Transportation Institute's Data on Metropolitan Congestion." (1999)

8 Rather than add the effects, each effect was squared, then summed, and the square root taken of this sum.

The following assumptions were also made:

- If a region did not model city/transit-focused development as part of their Smart Growth scenario, it was assumed to represent a 2-12% reduction in energy. The lower range reflects findings in Riverside and San Francisco, while the larger effects were base on San Diego, Sacramento, and Monterey efforts.
- If the region did not account for pricing in their Smart Growth scenario, it was assumed to represent a 2% reduction in energy. This reflects the findings in San Francisco and Sacramento.
- The benefits of jobs-housing balance, missing from most Smart Growth studies, were estimated based on each region's own jobs-housing balance.[9] An equation, based on the Riverside Smart Growth scenario,[10] resulted in a contribution of 0-1.1% reduction in energy.

These assumptions are reflected in the shaded Smart Growth energy reduction percentages of Table 4, ranging from 1.6%-13.7%.[11] This range of benefits, for the five Smart Growth regions, was then extrapolated to the rest of the state.

In doing so, three adjustments were made to account for local factors.

- In regions with less transit the high energy reduction estimate was reduced by 25%. Low transit regions were identified from MPO-provided data (less than 5% transit share) supplemented with 1998 Federal Transit Administration (FTA) data[12] (system-wide vehicle revenue miles below 350,000 in 1998).
- The high energy reduction estimate in fast growing regions was increased by 10%. Since it is easiest to modify new growth, rather than existing population and employment, a growing area has more potential to alter travel patterns through Smart Growth development patterns. The highest growth rates in California appear in the smaller and non-MPO regions.
- The high energy reduction estimate was reduced by 50% in non-MPO areas. It is assumed that such areas have less definable "centers" or nodes to direct development. Additionally, such areas tend to have little if any significant transit service.

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9 This implies either an increase in households or employment within the region to a target jobs per household ratio of 1.2.

10 *Jobs-Housing Effect* = (%*Commute VMT*) x (%*Reduction in jobs/HH ratio*) x (*trip length savings*)
Where:
*Commute VMT* share is assumed to be 30% per 1995 National Personal Transportation Study data.[10]
*Reduction in jobs/HH metric* is calculated as reduction of the region's 2020 jobs/HH ratio to 1.2. For smaller regions without employment data (Modesto, Visalia, San Luis Obispo), the jobs/HH ratio was assumed to be 20% lower than ideal, consistent with similarly sized regions.
*trip length savings* assumed to be 20 miles, per calibration to Riverside Smart Growth Study.

11 Where a region had only a single study (no high/low range), a low estimate was calculated as an average of the lower Riverside, San Francisco and Sacramento estimates, with adjustment for the local jobs-housing balance.

12 Federal Transit Association (FTA) National Transportation Database (1998), http://www.fta.dot.gov/ntl/databases/index.html …..

## TABLE 4: Estimated Annual Statewide Transportation Energy Saving with Smart Growth

| | **Trend without Smart Growth:** | | | | | **Estimated 2020 Smart Growth Energy Savings** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Daily VMT: | | Annual Energy: (1) | | Assumed | Low Estimate: | | | High Estimate: | | | |
| | (million veh miles) | | (billion BTUs) | | Jobs/HH | | reduced | (billion BTUs) | | reduced | (billion BTUs) | |
| MPO Region | 2000 | 2020 | 2000 | 2020 | Change | % | VMT/capita | Energy Svgs | % | VMT/capita | Energy Svgs | |
| Los Angeles | 363.0 | 474.2 | 771,323 | 1,007,589 | -11% | -2.8% | 21.87 | (27,805) | -12.4% | 19.72 | (124,083) | |
| San Francisco | 127.8 | 166.8 | 271,515 | 354,436 | -23% | -2.1% | 21.36 | (1,543) | -6.2% | 20.48 | (16,069) | |
| San Diego | 87.3 | 131.9 | 185,582 | 280,268 | None | -2.8% | 33.48 | (6,157) | -12.6% | 30.09 | (33,913) | |
| Sacramento | 46.5 | 69.7 | 98,876 | 148,078 | None | -1.6% | 25.87 | (1,897) | -13.7% | 22.68 | (19,891) | |
| Fresno | 19.0 | 29.3 | 40,384 | 62,355 | -5% | -2.8% | 22.65 | (4,695) | -9.3% | 21.14 | (8,540) | (2) |
| Monterey | 17.1 | 22.3 | 36,370 | 47,412 | -14% | -2.9% | 23.97 | (1,370) | -12.2% | 21.67 | (5,780) | |
| Bakersfield | 40.1 | 33.0 | 85,150 | 70,215 | -5% | -2.8% | 23.26 | (6,946) | -8.0% | 22.01 | (10,358) | (2-3) |
| Stockton | 14.5 | 23.9 | 30,917 | 50,726 | 27% | -3.1% | 28.08 | (1,023) | -12.5% | 25.37 | (5,819) | |
| Modesto | 11.1 | 17.2 | 23,648 | 36,539 | **20%** | -3.0% | 26.89 | (1,085) | -9.3% | 25.13 | (3,404) | (2) |
| Santa Barbara | 9.5 | 11.7 | 20,254 | 24,836 | -10% | -2.8% | 25.32 | (705) | -9.3% | 23.63 | (2,308) | (2) |
| Visalia | 9.2 | 14.2 | 19,469 | 30,083 | **20%** | -3.0% | 26.89 | (894) | -9.3% | 25.13 | (2,803) | (2) |
| San Luis Obispo | 6.1 | 9.5 | 13,050 | 20,165 | **20%** | -3.0% | 26.89 | (599) | -9.3% | 25.13 | (1,879) | (2) |
| Chico | 4.5 | 7.1 | 9,574 | 14,985 | None | -2.8% | 23.21 | (277) | -9.3% | 21.66 | (1,258) | (2) |
| Merced | 6.4 | 11.3 | 13,512 | 23,923 | 18% | -2.9% | 31.01 | (1,443) | -8.1% | 29.37 | (2,630) | (2-3) |
| Redding | 4.2 | 6.3 | 8,834 | 13,389 | 46% | -3.6% | 26.71 | (316) | -9.4% | 25.10 | (1,104) | (2) |
| | | | | | | | | | | | | |
| Outside MPOs | 27.5 | 47.3 | 58,455 | 100,458 | NA | -2.8% | 22.05 | (2,819) | 6.2% | 24.09 | 6,219 | (4) |
| | | | | | | | | | | | | |
| State | 793.8 | 1,075.5 | 1,686,914 | 2,285,456 | NA | -2.6% | | (59,573) | -10.2% | | (233,621) | |

Notes: Smart Growth consists of: (1) City and Transit-centered growth, (2) increased transit supply, (3) market pricing, and (4) improved jobs-housing balance.
Shaded values used data directly from the region's own Smart Growth studies, augmented to account for all four Smart Growth actions.
Bold values indicated assumptions made in the absence of MPO-provided data.
(1) Energy estimate assumes 5,822 BTUs per vehicle mile per Oak Ridge National Laboratory, Transportation Energy Data Book: Edition 19. (1999).
(2) Negligible transit service, high range estimate reduced by 25%.
(3) High population growth increases high range estimate savings by 10%.
(4) Assumed largely non-urban areas with limited transit, high range estimate reduced by 50%.

### 3.3. Annual Statewide Transportation Energy Savings

As a result, this effort found that California could reduce statewide transportation energy consumption by 3-10% with the implementation of Smart Growth policies across the state of California. This 3-10% reduction leads to energy savings of 60 – 238 trillion BTUs or 0.6-2.3 billion gallons of fuel[13] annually. The estimates are based on applying the results of Smart Growth modeling efforts of five California regions – Los Angeles (Western Riverside County), San Francisco, San Diego, Sacramento, and Monterey – where four Smart Growth actions were tested: (1) City and transit station-focused land use development; (2) Increases in transit supply; (3) Market pricing (parking fees); and (4) Improvements to regional job-housing balance. The statewide extrapolation, shown in Table 4, includes adjustments for local conditions of transit availability, high population growth, and regional jobs-housing imbalances.[14]

# 4. CLOSING REMARKS & RECOMMENDATIONS

This report closes by making policy recommendations for supporting Smart Growth planning within California, and recommends next steps to further this effort. Appendix C includes a summary of how the various Smart Growth actions identified in this report reduce energy consumption.

### 4.1. Policy Recommendations

Regions across the country, especially in large metropolitan areas, are increasing facing a choice: continued auto subsidy and dependency, more sprawl, decaying city centers, and more pavement; or market-based pricing reforms for economic efficiency, green belt protection, urban revitalization, and transit. California has an opportunity to be a leader in Smart Growth efforts, and make a significant impact nationally. Indeed, an assessment of Smart Growth development patterns of US counties over a 25-year period,[15] projected that under a sprawl scenario California accounted for 9% of the nation's sprawling development (second only to Florida), with 40% of the state's household growth likely to follow sprawl development patterns if not controlled. Six counties make the top 30 contributing to national sprawl: Riverside, Ventura, and San Bernardino (Los Angeles), Solano and Sonoma (San Francisco), and Placer (Sacramento). However, opportunities exist since according to the study, California had the 2nd highest potential to redirect up to 66% of this sprawl growth. Two counties (Stanislaus-Modesto and San Joaquin-Stockton) held the highest potential. California also contains eight of the top 30 fastest growing counties in the country (based on households): San Diego, Orange, Los

13 Based on San Francisco (MTC) data that implies 0.057 gallons of fuel per vehicle mile.

14 The estimated reduction is comparable to our previous statewide Smart Growth energy benefits of 5-18%, as estimated from a more theoretical national modeling framework. Source: Parsons Brinckerhoff memo to California Energy Commission, "California Energy Commission Statewide Transportation/Land Use Study,: Estimated VMT Reductions Due to Statewide Implementation of Smart Growth Principles." (July 2001)

15 The Brookings Institution, Parsons Brinckerhoff, ECONorthwest, "The Costs of Sprawl – Revisited: Empirical Evidence of Sprawl's Incidence," Transportation Research Board Transit Cooperative Research Program Project H-10. (May 2000)

Angeles, Riverside, and San Bernardino (Los Angeles), Contra Costa and Santa Clara (San Francisco), and Sacramento County.

California has several opportunities to assist regional and local entities in educating the populace and facilitating sustainable Smart Growth choices. The remainder of this section identifies polices to support Smart Growth in California and support the California Energy Commission's strategy, per AB 2076 (Shelley), to reduce petroleum dependence.

Some relevant existing and ongoing California legislation follows:

**AB 210 (Katz)** – This law enables a limited employer parking "cash-out" policy. That is, offering employees who receive free parking the choice of using the parking or receiving the equivalent value in cash. The law allows California Congestion Management Agencies (CMAs) to encourage employers to cash-out parking and convert them to other uses, independent of local parking requirements. The San Francisco (RAFT) study suggests that further strengthening of this bill would result by tying its use to air quality requirements. Research on cash-out and parking charges shows strong mode shifts away from driving alone.[16] Cash-out was estimated to account for 45% of the reduction in drive-along work trips in the San Francisco (RAFT) Smart Growth Scenario.

**AB 2140 (Keeley)** – This law supports MPOs in assessing the effects of Smart Growth planning, as an alternate to current 20-year regional transportation plan (RTP) projections. Since Smart Growth concepts run counter to current trends, education of government and the public as to the regional benefits of such policies, facilitated by this bill, will be valuable. MPOs should be encouraged to educate the public about the consequences of existing trends, potential benefits of Smart Growth policies, and then involve the public in decisions about how the region should grow.

**AB680 (Steinburg)** – This bill proposes to restructure retail taxation policies to encourage more market-driven retail location decisions. Because of California proposition 13, local jurisdictions have become highly reliant upon sales taxes for fiscal revenues. As a result localities compete for new retail (in particular because it has few negative attributes or expensive investment needs), and suburbs have historically won over central city locations.[17] However, a more market-driven location decision would scatter retail closer to residential demand, leading to shorter retail trips, and associated travel reduction and energy benefits.

[16] Wilson, R., Shoup, D., "The Effects of Employer-Paid Parking in Downtown Los Angel4es, SCAG. (1990) and Wilson, R., Shoup, D., Wachs, M., "Parking Subsidies and Commuter Mode Choice." SCAG. (1989)

[17] Wassmer, R., "Influences of the 'Fiscalization of Land Use' and Urban-Growth Boundaries," California Senate Office of Research. (July 2001)

The following policy recommendations are suggested based on MPO survey findings, supported by recent national policy discussions on urban planning:

- **Empower MPOs to affect land use decisions**, as arbitrators of competing local interests. A recent address to the US Congress[18] and recent Brookings Institute research on urban sprawl[19] both noted that regional planning is an important component to creating higher densities in urban areas. It states that regional planning and authority over both land use and transportation actions is important to significantly alter existing low-density growth patterns. Without regional governance, the parochial perspectives of local jurisdictions limit the political incentive to focus on the well being of the entire region. MPOs should be encouraged to exercise their existing powers to alter land use plans for regional benefit. Additionally, MPO reforms[20] could support changes in land use plans by fully representing all interests (changes to voting structures) and increase fiscal powers (taxing authority) to provide local incentives for evaluating the full costs of transportation investments. MPOs should be encouraged to experiment with policies consistently suggested by industry experts, such as market pricing schemes.
- **Educate MPOs and the public on Smart Growth**. Often regional leaders and the public are unaware of the consequences of current trends, and the potential benefits of Smart Growth. Education is an important component in the evaluation and acceptance of Smart Growth Actions. A model example of such an effort is the Regional Livability Footprint Project in the San Francisco Bay Area,[21] which is sponsoring a services of workshops in the region, with discussions of regional growth issues, challenges, with group visioning exercises that employ a graphical tool, where participant decisions on land use assumptions can be reviewed in real-time, as to their ability to meet regional forecasts and goals.
- **Improve MPO modeling capabilities**. An important step in the education process to further Smart Growth planning is the upgrade of MPO transportation models. Most models today do not fully capture the multi-modal nature and land use and congestion effects of Smart Growth plans. They are also dependent upon the input scenario assumptions, which have also historically avoided the more politically difficult Smart Growth scenarios (e.g. increased density, pricing), despite their significant benefits. Current congestion and air quality concerns may make such solutions more important in the future.

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[18] Downs, A., Testimony to the Subcommittee on Highways and Transit of the Committee on Transportation and Infrastructure, US House of Representatives (March 2001)

[19] Fulton, W., Pendall, R., Nguyen, M., Harrison, Al, "Who Sprawls Most? How Growth Patterns Differ Across the US," Brookings Institution, Center on Urban and Metropolitan Policy. (July 2001)

[20] Boarnet, M., Haughwout, A., "Do Highways Matter? Evidence and Policy Implications of Highways' Influence on Metropolitan Development," Brookings Institution Center on Urban and Metropolitan Policy. (August 2000)

[21] Association of Bay Area Governments (ABAG), Metropolitan Transportation Commission (MTC), Bay Area Air Quality Management District, Bay Conservation and Development Commission, Regional Water Quality Control Board, and Bay Area Alliance for Sustainable Development, "Briefing Book for Public Workshop Participants and Other Bay Area Residents," Smart Growth Strategy, Regional Livability Footprint Project. (August 2001)

### 4.2. Next Steps

The following are recommendations for ways to further the analysis of California statewide Smart Growth transportation energy savings:

**Continue the MPO Smart Growth studies** identified in this report, as well as forthcoming efforts by California MPOs. Such additional study could improve the estimates of Smart Growth energy savings by: (1) better understanding the aggressiveness of the Smart Growth scenarios; (2) the physical and political feasibility of different Smart Growth scenarios in each region; and (3) identification of Smart Growth efforts currently embedded in RTP plans. Two items of value in the statewide energy estimates using these studies are: more detailed information on local densities, transit investments, and jobs-housing estimates, as well as a more sophisticated conversion from VMT to energy savings, which accounts for fleet mix and congestion.

**National comparison of California Smart Growth expected savings** could be made relative to other states/regions across the country. This could provide a benchmark for California's progress as well as identifying ways other localities have promoted Smart Growth planning.

**Improve the energy consumption estimate**. Rather than use a single statistics to estimate transportation energy (BTU/mile), results would be enhanced by including variations in energy that result from regional travel speeds, vehicle fleet composition, and other factors.

## LIST OF SMART GROWTH STUDIES:

SACOG, "An Initial Assessment of 'Smart Growth' Impacts," Draft, in support of Steinburg bill AB680. (May 2001)

Hunt, J., Johnston, R., Abraham, J., Rodier, C., Garry, G., Putman, S., de la Barra, T., "Comparisons from the Sacramento Tested," Transportation Research Board Annual Meeting. (January 2001)

Lewis, S., "Land Use and Transportation: Envisioning Regional Sustainability," *Transport Policy* 5:3, pp. 147-161. (July 1998)

S. Smith, Bechtel, C., Studor, E., Placilla, E., "The Riverside County Integrated Project: A Bold Approach to Multi-Disciplinary, Concurrent Decision-Making for Transportation, Land Use, and Habitat Conservation," Transportation Research Board Annual Meeting. (January 2001)

AMBAG, "Tools for Assessing Jobs-Housing Balance and Commute Patterns in the Monterey Bay Region." (May 2001)

SANDAG, "2020 Cities/County Forecast Land Use Alternatives, Preliminary Analysis Data," memo to Regional Growth Management Technical Committee. (Oct 1998)

MTC, "Future Transit Use With an Alternative Land Use Scenario," memo to Partnership Planning & Operations Committee. (Sept 2000)

MTC, "Bay Area Blueprint Land Use Alternative (BABLUA): Pass #1: Summary at SD and County," Chuck Purvis memo to Chris Brittle. (September 1999)

MTC, "Bay Area Blueprint: Air Quality and Energy Estimates by Alternative," Chuck Purvis memo to File. (October 1999)

# APPENDIX A: MPO SMART GROWTH SURVEY INSTRUMENT

Hello California MPO Planner –

The California Energy Commission is seeking to assess potential statewide reductions in transportation energy consumption resulting from alternate or Smart Growth land use planning. This effort supports the commission's strategy to reduce California's dependence on petroleum, as part of state bill AB 2076. In this phase of the project, the commission is requesting that each California MPO respond to the following request for information about Smart Growth studies and modeling occurring within their region. The total energy reduction estimated from all regions will be tabulated and provide guidance for regional and statewide recommendations on energy efficient land use policy. Your timely response by July 18th will be very much appreciated. Alternatively, you can contact Tara Weidner (see end of survey) to schedule a 15-30 minute phone interview to relay your answers. A short follow-up interview may occur in late-August 2001, with results expected to be available in September 2001.

1. Has your organization evaluated (formally or informally) alternate land use or Smart Growth scenarios for accommodating future regional growth (e.g., limiting outward extension of growth, mixed use development, "Transit-Oriented Development", infill development, new forms of urban design, etc.)?

   If yes, please list the various scenarios, their Smart Growth components, and what prompted your evaluation.

   If not, is there interest or plans for future evaluation? What types of Smart Growth scenarios are of interest? Please skip to question 4.

2. How aggressive is (are) your Smart Growth scenario(s) (e.g. just a start, somewhat aggressive, very aggressive)? What factors affected the level of aggressiveness in the evaluated scenarios? What additional Smart Growth land use policies have been considered or make sense for your region?

3. What model assumptions were made to represent the Smart Growth scenario(s) (e.g., changes in transit service, parking costs, auto occupancy, demand management, land use densities)? You may want to attach a table or list.

4. So that we can compare various regions and travel analysis methods, please provide the listed summary data for each of the following scenarios. Note that a blank spreadsheet (Q4data.xls) has been provided to facilitate this request:

   Scenarios:

   (1) baseyear (current system);

   (2) future baseline (no Smart Growth); and

   (3) future Smart Growth scenario(s).

   Data Requested:

   - Daily VMT by Mode (e.g., auto, truck, transit) in region and in CBD
   - Map and Land Area of the region and CBD
   - Jobs and Households (or population) by zip code (if available), in region, and in CBD
   - Jobs and Households (or population) within 0.25 miles of transit in region and in CBD
   - Average Household size (to convert between population and households) in region and in CBD
   - Average Auto Occupancy by commute, other, and all trip purposes
   - Cost of Travel (e.g., transit fares, parking fees, tolls, etc.)
   - Transit Service (e.g., route miles, frequency, etc.)

The data is requested at both the Central Business District (CBD), or equivalent urban area boundary, and MPO region level. Copies of relevant reports covering regional study data and findings would also be appreciated. Note: If no Smart Growth scenarios have been evaluated, baseyear and baseline data are sufficient.

5. Please indicate how your MPO modeling/analysis methods address the following issues:

   - Land Use Forecasting including available land, vacant land/infill development, and future year population/employment allocation

- Trip Generation including auto ownership and induced demand

- Trip Distribution including destination choice (e.g., elastic or static with respect to travel costs/delay)

- Mode Split including available modes, treatment of non-motorized travel, shared ride, and auto occupancy (exogenous or endogenous)

***Thank You.***

*Please return by July 18th (and direct any questions) to*

*Tara Weidner, Parsons Brinckerhoff, weidner@pbworld.com. (503) 478-2342*

**Smart Growth Survey, July 2001**

| Scenarios | Daily VMT by: Auto | Truck | Transit | Land Area (acres) | Demographics: All Jobs | All Households* | Transit Accessible** Jobs | Transit Accessible** Households* | Household Size* |
|---|---|---|---|---|---|---|---|---|---|
| **Baseyear (Current System)** | | | | | | | | | |
| CBD | | | | | | | | | |
| Region | | | | | | | | | |
| **Future Baseline (no Smart Growth)** | | | | | | | | | |
| CBD | | | | | | | | | |
| Region | | | | | | | | | |
| **Future Smart Growth Scenario 1** | | | | | | | | | |
| CBD | | | | | | | | | |
| Region | | | | | | | | | |
| **Future Smart Growth Scenario 2** | | | | | | | | | |
| CBD | | | | | | | | | |
| Region | | | | | | | | | |
| **Future Smart Growth Scenario 3** | | | | | | | | | |
| CBD | | | | | | | | | |
| Region | | | | | | | | | |
| **Future Smart Growth Scenario 4** | | | | | | | | | |
| CBD | | | | | | | | | |
| Region | | | | | | | | | |

In addition: Attach a Map of the CBD and MPO region
Provide Demographics by Zipcode, if available

* Population can be substituted for Households (conversion made with household size data).
** Within 0.25 miles of transit.
*** User can identify other variables if more readily available, or appropriate.

**California Energy Commission**
**Smart Growth Survey, July 2001**

| Scenarios | Ave Auto Occupancy for: Commute | Other | All Trips | Cost of Travel*** Transit Fare | Parking | Tolls | Transit Service*** Route Miles | Frequency |
|---|---|---|---|---|---|---|---|---|
| **Baseyear (Current System)** | | | | | | | | |
| CBD | | | | | | | | |
| Region | | | | | | | | |
| **Future Baseline (no Smart Growth)** | | | | | | | | |
| CBD | | | | | | | | |
| Region | | | | | | | | |
| **Future Smart Growth Scenario 1** | | | | | | | | |
| CBD | | | | | | | | |
| Region | | | | | | | | |
| **Future Smart Growth Scenario 2** | | | | | | | | |
| CBD | | | | | | | | |
| Region | | | | | | | | |
| **Future Smart Growth Scenario 3** | | | | | | | | |
| CBD | | | | | | | | |
| Region | | | | | | | | |
| **Future Smart Growth Scenario 4** | | | | | | | | |
| CBD | | | | | | | | |
| Region | | | | | | | | |

# APPENDIX B SMART GROWTH SCENARIO DETAILS

<u>City-Centered or Transit Station-Centered Growth:</u>

**Western Riverside City-Centered** – Redistributes 25% of forecasted 26-year growth planned for unincorporated areas in the Trend scenario, to infill within existing city boundaries.

**Western Riverside Transit Nodes-** Assumes higher densities and intensities of land use within approximately 25 "transit nodes"(typically bus routes) located along existing transportation corridors, in addition to significant transit supply improvements. Development was focused within 0.25 mile of the transit hubs. The exact numbers vary depending upon the size and location of the nodes, and may involve either higher density infill within or near existing cities or completely new towns.

**San Francisco (MTC)** - Applies constant regional growth rates to baseyear socio-economic distribution. Constant growth rates to population (14% over 25 years), employment (24%), and jobs (27%) were applied uniformly, in percentage terms, to each analysis zone. This had the effect of increasing growth in developed urban areas, with lower percentage growth in suburban and rural areas over the Trend scenario. Additionally, the scenario was constrained to currently developed land for both residential and commercial/industrial uses. The land constraint had the effect of increasing densities by 17%. Of 34 regional analysis zones, only half show changes of over 6% relative to the household forecasts of the Trend scenario.

**San Francisco (RAFT) –**Redistributes growth to compact mixed use areas near high capacity transit stations (BART and CalTrain stations) and along major bus routes. No growth allowed in the region's greenbelt. Job growth focused in transit-accessible existing job centers and old brownfields.

**San Diego** - Redistributes growth such that all future residential development occurs at the top end of the density ranges expressed in the general and community plans. Looks for opportunities to redevelop/infill according to planned densities. (One alternative placed caps on residential development in unincorporated areas). Avoids future growth on land with very low planned density or land currently in agricultural use.

**Sacramento (SACOG)** – Applies daily VMT per capita representative of Smart Growth development (11.19 daily arterial VMT/capita, consistent with non-CBD part of city of Sacramento) to all urbanized areas. Lower rates were applied elsewhere (50% VMT/capita reduction in semi-rural areas and no change to rural areas). Inferred increased density and mixing of development types in line with Smart Growth principles, leading to fewer and shorter vehicle trips.

**Monterey City-Centered** – Redistributes forecasted 20-year growth to land within the existing city boundaries. No growth was allowed outside the current city boundaries.

<u>Transit Supply:</u>

**Monterey Transit Nodes** – Redistributes future growth with 0.5 miles of 22 existing and potential commuter rail stations.

**Western Riverside Transit Nodes** – Assumed a significantly upgraded transit system to support transit station-centered land use assumptions. Transit (bus and/or rail) was assumed to connect development nodes at high frequency (at least every 15 minutes) and reasonably high speeds (limited stops). Aggressive transit mode share was assumed (capture up to 33 percent of node-to-node trips)

**San Francisco (MTC)** – Assumes significant improvements in regional express bus service, in addition to city-centered land use assumptions. The assumed express bus service transportation improvement package[22] includes new and expanded express bus service throughout the region. It was chosen among other "packages" (i.e., urban rail expansion, rapid water transit expansion, and roadway) as it was felt to have the greatest impact on transit use.

**San Francisco (RAFT)** – Reallocates the 98% of future transportation investment funds from highway to transit, in addition to land use and pricing assumptions. Transportation funds were assumed to support upgrades and extensions of commuter rail, light rail, express bus, and local bus service, with five new intermodal stations. All projects were taken from existing MPO project lists. Three future highway projects (10 new highway lane miles, 2% of Trend scenario lane miles) were assumed relative to the baseyear network. They widen critical highway bottlenecks and improve arterials in lieu of a proposed freeway.

**Sacramento (UCDavis)** – Assumed extensions of various light rail transit lines within Sacramento County, in addition to pricing assumptions.

<u>Market Pricing:</u>

**San Francisco (RAFT)** – Assumed cash-out of employer paid parking, in addition to city/transit-centered land use and increase transit supply assumptions. A cash-out program involves offering employees who receive free parking the choice of using the parking or receiving the equivalent value in cash. Due to model constraints, the pricing policy was modeled in reverse, as a $3 per day increase in existing parking charges, applied throughout the region (more impact in suburban areas).

**San Francisco (MTC)** – Assumes a $2.60 increase in work trip parking cost across region. As above, this represented an employee parking cash-out program

**Sacramento (UCDavis)** – Increases vehicle operating and parking costs, in addition to increased transit supply. Pricing assumptions included increasing private vehicle operating cost by 30% (e.g., through taxation) and increased Sacramento CBD parking rate by $4 for work and $1 for other trips.

<u>Jobs-Housing Balance:</u>

**Western Riverside - New Jobs** – Assumes an increase in jobs in Western Riverside County so the jobs per household ratio matched SCAG regional average. The new jobs increased the 2020 jobs/household ratio from 1.1 to 1.4. The region currently experiences significant out-commuting to nearby Orange and Los Angeles Counties.

[22] from MTC's *Bay Area Blueprint for the 21st Century Evaluation Report*

# APPENDIX C SMART GROWTH METHODS TO REDUCE ENERGY USE

Smart Growth travel savings, and associated transportation energy savings, result from two effects: trips that shift to a more-energy-efficient mode and shortened vehicle trips. Smart Growth policies that lead to higher densities in cities and/or near transit stations, increase transit supply, as well as more socially price auto usage, increase use of transit and non-motorized travel modes. Smart Growth policies of mixing land uses and improving jobs-housing balance, which put work and other destinations closer to home, reducing trip lengths. These and related effects, most effective in combination, are summarized below:

*City-Centered Development* – Smart growth seeks to revitalize central cities and older suburbs, focusing growth within the already-built environment and fostering efficient development at the edges of metropolitan regions. In many cases, Smart Growth seeks to restore historically higher densities, while preserving open space and agricultural lands. The traditional neighborhood design and higher densities of urban and second city places reduces auto-dependence, thereby reducing travel needs and transportation energy use.

*Mixed Use Development* –Smart growth seeks a rich mixture of land uses (e.g., employment, residential, leisure, and public). People living within easy walking distance of shops, schools, parks, and public transit have the option to reduce their driving and therefore use less energy than those living in auto-dependent neighborhoods. A 1994 travel behavior survey in Portland, OR,[23] found the auto mode share in mixed development served by transit was 58% compared to 74% without mixed development, and 82-87% for the rest of the region. This integration of work, home, and daily activities differs from traditional zoning requirements that separate residences from other types of land uses.

*Transit-Oriented Development*. Adding to the benefits of city-centered and mixed use development, transit oriented development directs higher densities in close proximity to the transit system, greatly encouraging the use of transit. The more stations with such designs increases the ability of transit to serve the variety of travel purposes. People rarely walk more than 0.5 miles to transit stations, increasing the need for higher densities within this radius, with less dense development further away. Instead, increasing the number and transit connectivity of regional centers (i.e., second cities) can improve transit ridership levels. By focusing growth around more easily served centers, particularly in urban areas lacking nodal development, a region can expect significant transit ridership increases, according to recent modeling by Portland Metro. Indeed, the San Francisco MPO (MTC) Smart Growth effort found land use had a higher impact on transit use than increasing transit supply itself.

*Improved Transit Service* – Smart Growth seeks to improve alternatives to the auto for travel, including making transit a more competitive with the auto. This may include extending transit service areas, expanding service frequencies, and other amenities that

[23] Metro 1994 Travel Behavior Survey, Portland Metro, OR, Keith Lawton. (1997)

improve transit convenience (e.g., timed transfers, fare structure, traffic signal pre-emption)

*Market-Based Pricing* – Smart Growth policies can also be enhanced by pricing travel at true market rates. The cost of auto use has historically under-priced the social cost of travel, hidden the subsidization of roadway infrastructure, and structured costs such that marginal costs appear small (e.g. annual registration fees and insurance premiums are often discounted in per mile perceived costs The San Francisco (RAFT) Smart Growth study author notes auto "demand is so subsidized that market reforms would save time and decongest highways for at least 20 years, as well as make the economy more productive."[24] Market pricing such as removing employer parking cost subsidies or increasing auto operating costs (e.g. gas taxes) provides incentives for people to take advantage of more energy-efficient modes. ). Such pricing also influences land use by providing an incentive for people to seek out transit-oriented neighborhoods and use more transit, potentially leading to more compact development to curb travel costs. The SF (MTC) study found that pricing had the largest effect on congestion reduction, as opposed to land use changes, which had a higher impact on mode shift.

*Job-Housing Balance* – Smart Growth seeks to reduce trip lengths, and is thus supported by a jobs-housing balance, which reduces commuting travel. Coordinating job growth with housing growth and ensuring a good match between income levels and housing prices, can reverse the trend toward longer commutes, particularly to bedroom communities beyond the region's boundaries.

[24] Lewis, S., "Land Use and Transportation: Envisioning Regional Sustainability," *Transport Policy* 5:3, pp. 147-161. (July 1998